

Multi Robots Task Assignments Problems Solved by Genetic Algorithm

Chen Peng^a

^a*Mechanical and Aerospace Engineering Department, UC, Davis, US
(penchen@ucdavis.edu,)*

Abstract: This term paper mainly uses genetic algorithm to solve the multi robots task assignment(MRTA) problems in two situations. We assume that each robot can go directly from one point to another and the distance is just the euclidean distance between two points. One task only needs one robot in one assignment and all tasks need to be visited in one task execution. In the first situation, we have the same amounts of robots as the tasks (m vs m), while in the second condition, we have less robots than tasks. The objective function of both problems is to find the shortest summary distances of all the robots to go over all task points.

Keywords: MRTA, genetic algorithm, TSP, mTSP

1 INTRODUCTION

Multi-robot systems (MRS) are a group of robots that are designed aiming to perform some collective behavior. One of the most challenging problems of MRS is how to optimally assign a set of robots to a set of tasks in such a way that optimizes the overall system performance subject to a set of constraints. This problem is known as Multi-robot Task Allocation (MRTA) problem Alaa Khamis and Elmogy [2015]. In the first situation, we want to match each robot with one particular task so that the total distance is shortest. This is very similar to the classic problem of traveling salesman problem: "Given a list of cities and the distances between each pair of cities, what is the shortest possible route that visits each city exactly once and returns to the origin city?" wik [2016] In the second condition, we consider less robots to visit more tasks. This problem is very similar to mTSP problem: The multiple traveling salesman problem (MTSP) involves scheduling $m < 1$ salesmen to visit a set of $n > m$ nodes so that each node is visited exactly once. Sedighpour et al. [2012]

2 M ROBOTS M TASKS

In the first situation,

2.1 Genetic algorithm model

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4 M ROBOTS N TASKS(M < N)

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4.3 mTSP solver

ACKNOWLEDGMENTS

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APPENDICES

If more than one, appendices should be lettered A, B, etc., e.g. Appendix A.